



TRANSLATION

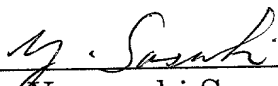
I, Yasuyuki Sasaki, residing at 1-3-1-204, Higashimonzen, Kawasaki-ku, Kawasaki-shi, Kanagawa-ken, Japan, state:

that I know well both the Japanese and English languages;

that I translated, from Japanese into English, the specification, claims, abstract and drawings as filed in U.S. Patent Application No. 09/921,703, filed August 6, 2001; and

that the attached English translation is a true and accurate translation to the best of my knowledge and belief.

Dated: August 20, 2001



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09/921,703

#3

TITLE OF THE INVENTION

IMAGE PROCESSING APPARATUS AND IMAGE PROCESSING METHOD

BACKGROUND OF THE INVENTION

5 The present invention relates to an image
processing apparatus and an image processing method,
and more particularly to an image processing apparatus
and an image processing method for outputting page
descriptor information with high quality, which has
been formed by an image forming apparatus such as a
10 personal computer.

In general, when page description information such
as DTP data, which is formed by a personal computer, is
to be output from an image output apparatus such as a
printer, the data to be output is sent to an image
15 output apparatus such as a printer or an MFP via a
printer controller that receives the page description
information and develops it to image data comprising
pixel arrays of four colors, Cyan, Magenta, Yellow and
Black, which represent ink amounts. The printer
20 controller not only performs development to image data
but also produces discrimination data representative of
attributes of respective pixels of the image data.

For example, Jpn. Pat. Appln. KOKAI Publication
No. 9-282472 discloses a technique wherein characters
25 or given discrimination signals representing other
attributes, as well as image data, are produced and
transmitted, and the image data is subjected to an

image process corresponding to the discrimination
signals in an image output apparatus. Thereby, where
image data includes character information, an image
process, for example, for preventing degradation in
5 quality of characters is performed and the data is
output from the image output apparatus.

On the other hand, Jpn. Pat. Appln. KOKAI
Publication No. 2000-270213 discloses a technique
wherein generated discrimination data is converted to
10 data representing correspondency with image data,
thereby reducing the memory capacity needed for storing
the discrimination data.

In the technique disclosed in the above-mentioned
Jpn. Pat. Appln. KOKAI Publication No. 9-282472,
15 however, image development means (i.e. printer
controller) simultaneously produces image data and
discrimination data on the basis of page description
information, and the image data is output from an image
forming apparatus capable of switching image processes
20 according to the discrimination data. In this case, an
ordinary printer controller is unable to generate
desired discrimination data, and thus the printer
controller is limited to a specific type.

Moreover, when an ordinary printer controller is
25 used, image data matching with characteristics of an
output apparatus is not necessarily produced. For
example, in the case of a color image having a colored

background on which black characters are written, such
image data is produced in ordinary cases that the black
character portion is written in black alone and there
is no information on the color of the background. In
5 the case where this image data is output as such from a
printer, if an error has occurred in print position
between black ink and color ink, a colorless portion
forms around the character and the image quality
deteriorates.

10

BRIEF SUMMARY OF THE INVENTION

The object of the present invention is to provide
an image processing apparatus and an image processing
method capable of performing a high-image-quality image
process matching with output characteristics of a
15 printer, even in a case where an ordinary printer
controller is used.

In order to achieve the object, the present
invention provides an image processing apparatus
comprising: image development means for generating
20 first image data and first discrimination data
representing attributes of each of pixels of the first
image data on the basis of information described in a
page description language; discrimination data
generating means for generating second discrimination
25 data different from the first discrimination data,
using the first image data and the first discrimination
data generated by the image development means; image

data generating means for generating second image data
by correcting the first image data generated by the
image development means on the basis of the second
discrimination data generated by the discrimination
5 data generating means; image processing means for
subjecting the second image data generated by the image
data generating means to a predetermined process on the
basis of the second discrimination data generated by
the discrimination data generating means; and image
10 output means for outputting image data processed by the
image processing means.

The invention provides an image processing
apparatus comprising: image development means for
generating first image data and first discrimination
15 data representing attributes of each of pixels of the
first image data on the basis of information described
in a page description language; discrimination data
generating means for generating second discrimination
data different from the first discrimination data,
20 using the first image data generated by the image
development means; image data generating means for
generating second image data by correcting the first
image data generated by the image development means on
the basis of the second discrimination data generated
25 by the discrimination data generating means and the
first discrimination data generated by the image
development means; image processing means for

subjecting the second image data generated by the image data generating means to a predetermined process on the basis of the first discrimination data generated by the image development means and the second discrimination data generated by the discrimination data generating means; and image output means for outputting image data processed by the image processing means.

The invention provides an image processing apparatus comprising: image development means for generating first image data and first discrimination data representing attributes of each of pixels of the first image data on the basis of information described in a page description language; discrimination data generating means for generating second discrimination data different from the first discrimination data, using the first image data generated by the image development means or using the first image data and the first discrimination data; image processing means for subjecting the first image data generated by the image development means to a predetermined process on the basis of the second discrimination data generated by the discrimination data generating means and the first discrimination data generated by the image development means; and image output means for outputting image data processed by the image processing means.

The invention provides an image processing apparatus comprising: input means for inputting data

from an external unit that generates first image data
and first discrimination data representing attributes
of each of pixels of the first image data; setting
means for desiredly setting the type of attributes
5 represented by the first discrimination data input by
the input means; discrimination data generating means
for generating second discrimination data different
from the first discrimination data, using the type of
attributes set by the setting means and the first image
10 data and the first discrimination data input by the
input means; image data generating means for generating
second image data by correcting the first image data
input by the input means on the basis of the second
discrimination data generated by the discrimination
15 data generating means; image processing means for
subjecting the second image data generated by the image
data generating means to a predetermined process on the
basis of the second discrimination data generated by
the discrimination data generating means; and image
20 output means for outputting image data processed by the
image processing means.

The invention provides an image processing
apparatus comprising: input means for inputting data
from an external unit that generates first image data
25 and first discrimination data representing attributes
of each of pixels of the first image data; discrimina-
tion data generating means for generating second

discrimination data different from the first
discrimination data, using the first image data input
by the input means; setting means for desirably setting
the type of attributes represented by the first
5 discrimination data input by the input means; image
data generating means for generating second image data
by correcting the first image data input by the input
means on the basis of the type of attributes set by the
setting means, the first discrimination data input by
10 the input means and the second discrimination data
generated by the discrimination data generating means;
image processing means for subjecting the second image
data generated by the image data generating means to a
predetermined process on the basis of the type of
15 attributes set by the setting means, the first
discrimination data input by the input means and the
second discrimination data generated by the
discrimination data generating means; and image output
means for outputting image data processed by the image
20 processing means.

The invention provides an image processing
apparatus comprising: input means for inputting data
from an external unit that generates first image data
and first discrimination data representing attributes
25 of each of pixels of the first image data; discrimina-
tion data generating means for generating second
discrimination data different from the first

discrimination data, using the first image data input
by the input means; setting means for desirably setting
the type of attributes represented by the first
discrimination data input by the input means; image
5 processing means for subjecting the first image data
input by the input means to a predetermined process on
the basis of the type of attributes set by the setting
means, the first discrimination data input by the input
means and the second discrimination data generated by
10 the discrimination data generating means; and image
output means for outputting image data processed by the
image processing means.

The invention provides an image processing method
for image-processing information described in a page
15 description language, and outputting an image,
comprising: generating first image data and first
discrimination data representing attributes of each of
pixels of the first image data on the basis of the
information described in the page description language;
20 generating second discrimination data different from
the first discrimination data, using the generated
first image data and first discrimination data;
generating second image data by correcting the
generated first image data on the basis of the
25 generated second discrimination data; subjecting the
generated second image data to a predetermined process
on the basis of the generated second discrimination

data; and outputting processed image data.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

FIG. 1 is a block diagram showing the structure of
an image processing apparatus according to a first
5 embodiment of the present invention;

FIG. 2 shows an example of the structure of image
development means;

FIG. 3 shows an example of the structure of
discrimination data generating means;

10 FIG. 4 shows an example of the structure of an
edge detection section in the discrimination data
generating means;

FIG. 5 shows an example of the structure of a
color detection section in the discrimination data
15 generating means;

FIG. 6 shows an example of the structure of a
synthetic determination section in the discrimination
data generating means;

20 FIG. 7 shows an example of conversion by a
converter;

FIG. 8 shows an example of the structure of image
data generating means;

FIG. 9A shows an example of first image data;

25 FIG. 9B shows an example of second image data in a
case where an output value of the first image data has
been replaced;

FIG. 10 is a view for describing a smoothing

process;

FIG. 11 shows an example of the structure of image processing means;

FIG. 12 shows an example of a correction table;

5 FIG. 13 shows an example of the correction table;

FIG. 14 shows an example of the correction table;

FIG. 15 shows an example of the correction table;

FIG. 16 shows an example of the correction table;

FIG. 17 shows an example of the correction table;

10 FIG. 18 shows an example of the correction table;

FIG. 19 shows an example of the correction table;

FIG. 20 is a block diagram showing the structure of an image processing apparatus according to a second embodiment;

15 FIG. 21 is a block diagram showing the structure of an image processing apparatus according to a third embodiment;

FIG. 22 is a block diagram showing the structure of an image processing apparatus according to a fourth embodiment;

20 FIG. 23 is a block diagram showing the structure of an image processing apparatus according to a fifth embodiment; and

25 FIG. 24 is a block diagram showing the structure of an image processing apparatus according to a sixth embodiment.

DETAILED DESCRIPTION OF THE INVENTION

Embodiments of the present invention will now be described with reference to the accompanying drawings.

FIG. 1 is a block diagram showing the structure of an image processing apparatus 1 according to a first embodiment of the present invention. This image processing apparatus 1 is called a printer in usual cases. The apparatus receives document data, etc. produced by a personal computer via a network, etc., generates image data comprising toner amount information, and transfers toner on paper, thus performing image formation.

The image processing apparatus 1 comprises image development means (controller unit) 11, discrimination data generating means 12, image data generating means 13, image processing means 14, and image output means (printer) 15.

The image development means 11 receives DTP (Desk Top Publishing) data formed on a personal computer or document data of a word processor, etc. as page information described in a page description language (PDL). The image development means 11 develops the received data to first image data as bit map data and to first discrimination data representative of attributes of each pixel.

The page information contains characters as font data, figures as line description data or painted-out

region data, and others as ordinary raster image data.
When the page information is output as a print image,
it is necessary to develop all data as the same bit map
data.

5 In addition, it is necessary to develop the
attribute data to pixel-by-pixel discrimination data so
that the image processing means 14 may perform an
appropriate image quality enhancing process in
accordance with attributes of image data.

10 Alternatively, the image processing apparatus may
be constructed such that the image development means 11
is provided as an external element as a printer
controller.

15 The discrimination data generating means 12
generates second discrimination data for each pixel,
which is necessary for controlling the image processing
means 14, on the basis of the first image data and the
first discrimination data. The second discrimination
data differs from the first discrimination data and
20 corresponds to an image area discrimination signal that
is commonly used in a copying machine, etc.

 Accordingly, even where a scanner is connected to
the image processing apparatus 1 for the purpose of use
as a copying machine, the second discrimination data
25 can be generated from the scanner input image.

 It is necessary, however, to switch the method of
generating the second discrimination data, depending on

which of images should be treated as first image data,
the images being obtained in a case where the scanner
input image is processed and in a case where the
information of the page description language is
5 developed to the image.

The image data generating means 13 corrects the
first image data on the basis of the second
discrimination data generated by the discrimination
data generating means 12, and thus generates second
10 image data. The correction of the image data in this
context is effected by an over-print process, which is
performed based on the fact that a white blank portion
forms between a black line and a C, M, or Y color
component background due to a print position error at
15 the time of printing out, a trapping process, a
character smoothing process, etc.

The image processing means 14 performs a process
for emphasizing an image (in particular, a character)
at the time of printing out. General methods of the
20 process are filtering, gamma correction, etc. A filter
coefficient or a gamma correction table is switched in
accordance with the second discrimination data.

The image output means 15 uses output image data
(corresponding to the ink amount of each color in the
25 case of a printer) generated by the image processing
means 14, and transfers ink on a printing medium (paper,
etc.).

FIG. 2 shows an example of the structure of the image development means 11. The image development means 11 comprises a CPU 21, a RAM 22 and a page memory 23. The page information received by the image development means 11 is converted to first image data and first discrimination data by the CPU 21, which is then developed in the page memory 23 and transmitted pixel by pixel.

FIG. 3 shows an example of the structure of the discrimination data generating means 12. The discrimination data generating means 12 comprises line buffers 31a and 31b, an edge detection section 32, a color detection section 33 and a synthetic determination section 34.

The first image data transmitted from the image development means 11 is input to the line buffer 31a of the discrimination data generating means 12. The first image data is accumulated in the line buffer 31a by several lines, thereby forming block data.

The first image data output from the line buffer 31a is sent to the edge detection section 32, and it is determined for each color component whether a center pixel ("pixel of interest") of the block corresponds to an edge portion.

In addition, the first image data output from the line buffer 31a is sent to the color detection section 33, and it is determined based on the chroma whether

the pixel of interest has an achromatic color or a chromatic color.

On the other hand, the first discrimination data transmitted from the image development means 11 is
5 input to the line buffer 31b of the discrimination data generating means 12. The line buffer 31b is used for establishing synchronism with the first image data.

The synthetic determination section 34 outputs
10 second discrimination data by performing synthetic determination on the basis of the edge detection result from the edge detection section 32, the determination result from the color detection section 33, and the first discrimination data synchronized by the line buffer 31b.

15 FIG. 4 shows an example of the structure of the edge detection section 32 in the discrimination data generating means 12. The edge detection section 32 comprises multipliers 41a and 41b, adders 42a and 42b, positive number generators 43a and 43b, an adder 44 and
20 a comparator 45. The edge detection section 32 is provided for each of the color component image signals C, M, Y and K of the first image data input from the line buffer 31a, and the edge detection is performed in parallel.

25 The multiplier 41a multiplies a 3×3 matrix of the first image data with coefficients (edge detection operators) shown in FIG. 4 by symbol A. The adder 42a

adds calculated values of the multiplier 41a. The positive number generator 43a produces an absolute value of the value calculated by the adder 42a.

5 The multiplier 41b multiplies a 3×3 matrix of the first image data with coefficients (edge detection operators) shown in FIG. 4 by symbol B. The adder 42b adds calculated values of the multiplier 41b. The positive number generator 43b produces an absolute value of the value calculated by the adder 42b.

10 Subsequently, the adder 44 adds the two absolute values obtained by the absolute value generators 43a and 43b. The comparator 45 compares the added value with a predetermined value, thereby determining the presence/absence of the edge.

15 The comparison result of the comparator 45 is output to the synthetic determination section 34 as an edge determination result EC, EM, EY, EK, in association with a color component image signal C, M, Y, K in the first image data input from the line
20 buffer 31a.

FIG. 5 shows an example of the structure of the color detection section 33 in the discrimination data generating means 12. The color detection section 33 comprises subtracters 51a, 51b and 51c, positive number
25 generators 52a, 52b and 52c, a maximum value selector 53, a comparator 54, digitizers 55a, 55b, 55c and 55d, selectors 56a, 56b, 56c and 56d, AND gates 57a, 57b and

57c, and a NOT gate 58.

5 The subtracter 51a calculates a difference in
density between color components (C, Y) of image
signals of the first image data input from the line
buffer 31a, and outputs the difference to the positive
number generator 52a. The positive number generator
52a produces an absolute value of the input density
difference between the color components (C, Y), and
outputs the absolute value to the maximum value
10 selector 53.

15 The subtracter 51b calculates a difference in
density between color components (C, M) of image
signals of the first image data input from the line
buffer 31a, and outputs the difference to the positive
number generator 52b. The positive number generator
52b produces an absolute value of the input density
difference between the color components (C, M), and
outputs the absolute value to the maximum value
selector 53.

20 The subtracter 51c calculates a difference in
density between color components (M, Y) of image
signals of the first image data input from the line
buffer 31a, and outputs the difference to the positive
number generator 52c. The positive number generator
25 52c produces an absolute value of the input density
difference between the color components (M, Y), and
outputs the absolute value to the maximum value

selector 53.

The maximum value selector 53 selects a maximum of the values input from the positive number generators 52a, 52b and 53c, and outputs the maximum value to the comparator 54.

The comparator 54 compares the input maximum value and a predetermined value, and determines whether the color is achromatic or chromatic.

On the other hand, the digitizer 55a digitizes the density of the color component image signal C of the first image data input from the line buffer 31a. The digitizer 55b digitizes the density of the color component image signal M of the first image data input from the line buffer 31a. The digitizer 55c digitizes the density of the color component image signal Y of the first image data input from the line buffer 31a. The digitizer 55d digitizes the density of the color component image signal K of the first image data input from the line buffer 31a.

The digitized result represents which color component is effective in the synthetic determination section. When the digitized result of the image signal K, i.e. the output of the digitizer 55d, is "1", there is a case where a black over-print process (for incorporating a background density in the image data of the color component C, M, Y) is performed at the time of image development. An AND value between the

digitized result of the image signal C, M, Y and an inverted value of the digitized result of the image signal K is obtained.

Specifically, the digitized result of the digitizer 55a and an inverted value of the digitized result of the digitizer 55d are input to the AND gate 57a to produce an AND value. The digitized result of the digitizer 55b and an inverted value of the digitized result of the digitizer 55d are input to the AND gate 57b to produce an AND value. The digitized result of the digitizer 55c and an inverted value of the digitized result of the digitizer 55d are input to the AND gate 57c to produce an AND value.

The selector 56a receives the comparison result of the comparator 54 and the AND value of the AND gate 57a, selects one of them, and outputs a select result SC. The selector 56b receives the comparison result of the comparator 54 and the AND value of the AND gate 57b, selects one of them, and outputs a select result SM. The selector 56c receives the comparison result of the comparator 54 and the AND value of the AND gate 57c, selects one of them, and outputs a select result SY. The selector 56d receives the comparison result of the comparator 54, which has been inverted by the NOT gate 58, and the digitized result of the digitizer 55d, selects one of them, and outputs a select result SK.

This operation is performed since it is necessary

to effect switching between the use as a copying machine and the use as a printer.

FIG. 6 shows an example of the structure of the synthetic determination section 34 in the discrimination data generating means 12. The synthetic determination section 34 comprises converters 61a, 61b, 61c and 61d, and AND gates 62a, 62b, 62c and 62d.

Signals EC, EM, EY and EK input from the edge detection sections 32 associated with the image signals C, M, Y and K represent the edge detection results of C, M, Y and K. Signals SC, SM, SY and SK input from the color detector 33 represent the color detection results of C, M, Y and K.

The converter 61a receives the edge detection result EC from the edge detector 32 and the first discrimination data from the line buffer 31b, and outputs desired converted discrimination data based on them.

The converter 61b receives the edge detection result EM from the edge detector 32 and the first discrimination data from the line buffer 31b, and outputs desired converted discrimination data based on them.

The converter 61c receives the edge detection result EY from the edge detector 32 and the first discrimination data from the line buffer 31b, and outputs desired converted discrimination data based on

them.

The converter 61d receives the edge detection result EK from the edge detector 32 and the first discrimination data from the line buffer 31b, and
5 outputs desired converted discrimination data based on them.

FIG. 7 shows an example of conversion by the converters 61a, 61b, 61c and 61d. In FIG. 7, the first discrimination data is classified such that a character
10 described as font data with a predetermined size or less is "TEXT", an object described as line description data or painted-out data and a character other than "TEXT" are "GRAPHIC", and an object other than "TEXT" and "GRAPHIC" is "IMAGE".

15 For example, when the first discrimination data is "TEXT" and the edge detection result is "EDGE", the second discrimination data is output as "NEW-TEXT" (conversion result). When the first discrimination data is "IMAGE" and the edge detection result is "NON-
20 EDGE", the second discrimination data is output as "NEW-GRAPHIC" (conversion result).

The desired discrimination data (second discrimination data) output from the converter 61a is input to the AND gate 62a. The AND gate 62a produces
25 second discrimination data DC as an AND value between the desired discrimination data input from the converter 61a and the color detection result SC input

from the color detection section 33.

5 The desired discrimination data (second
discrimination data) output from the converter 61b is
input to the AND gate 62b. The AND gate 62b produces
second discrimination data DM as an AND value between
the desired discrimination data input from the
converter 61b and the color detection result SM input
from the color detection section 33.

10 The desired discrimination data (second
discrimination data) output from the converter 61c is
input to the AND gate 62c. The AND gate 62c produces
second discrimination data DY as an AND value between
the desired discrimination data input from the
converter 61c and the color detection result SY input
15 from the color detection section 33.

20 The desired discrimination data (second
discrimination data) output from the converter 61d is
input to the AND gate 62d. The AND gate 62d produces
second discrimination data DK as an AND value between
the desired discrimination data input from the
converter 61d and the color detection result SK input
from the color detection section 33.

25 FIG. 3 shows an example of the structure of the
image data generating means 13. The image data
generating means 13 comprises line buffers 71a and 71b,
a background density averaging section 72, a character
density averaging section 73, and a selector 74.

The line buffer 71a accumulates n-lines of the first image data output from the image development means 11.

5 The line buffer 71b accumulates n-lines of the second discrimination data output from the discrimination data generating means 12.

10 The background density averaging section 72 calculates the average density of each of the color components C, M and Y as regards a pixel within $n \times n$ pixels around a pixel of interest, with respect to which the second discrimination data DK on the color component K is not "NEW-TEXT".

15 On the other hand, the character density averaging section 73 calculates the average density of each of the color components C, M, Y and K within an area of $m \times m$ pixels ($m \leq n$) around the pixel of interest.

The selector 74 outputs second image data by properly replacing the pixel values in accordance with the second discrimination data on the pixel of interest.

20 For example, when the pixel value of K of the pixel of interest is "NEW-TEXT" and all the pixel values of C, M and Y are zero, the data C, M, Y of the pixel of interest shown in FIG. 9A is changed to the output value of the background density averaging
25 section 72 as shown in FIG. 9B (over-print process or trapping process). Specifically, the first image data C, M, Y, K shown in FIG. 9A is replaced with the output

value of the second image data C, M, Y, K shown in
FIG. 9B.

Similarly, when the color component of K of the
pixel of interest is "NEW-TEXT", the pixel value of K
5 of the pixel of interest is replaced with the output
value of the character density averaging section 73, as
shown in a, b and c of FIG. 10 (smoothing process,
etc.).

The processing of the image data generating means
10 13 has been described above merely by way of example,
and the content of the processing is not limited to the
above-described one.

FIG. 11 shows an example of the structure of the
image processing means 14. The image processing means
15 14 comprises line buffers 101a and 101b, a filter
section 102, a gamma correction section 103, and a
screen processing section 104.

The line buffer 101a accumulates several lines of
the second image data generated by the image data
20 generating means 13 for the purpose of filter
processing.

The line buffer 101b outputs the second
discrimination data on the pixel of interest (center
pixel of an image matrix) in synchronism with the
25 second image data.

The filter section 102 multiplies each pixel of
the image matrix buffered by the line buffer 101b with

a predetermined coefficient, thus calculating the sum.
In this case, the filter section 102 changes the
coefficient for multiplication in accordance with the
second discrimination data output synchronously from
the line buffer 101b.

The gamma correction section 103 corrects each
pixel of the second image data for each color component,
using correction tables as shown in FIGS. 12 to 19. In
this case, the gamma correction section 103 switches
the correction table in accordance with the second
discrimination data output synchronously from the line
buffer 101b.

A correction table shown in FIG. 12 relates to
correction of color component C in a case where the
second discrimination data is "NEW-TEXT".

A correction table shown in FIG. 13 relates to
correction of color component C in a case where the
second discrimination data is not "NEW-TEXT".

A correction table shown in FIG. 14 relates to
correction of color component M in a case where the
second discrimination data is "NEW-TEXT".

A correction table shown in FIG. 15 relates to
correction of color component M in a case where the
second discrimination data is not "NEW-TEXT".

A correction table shown in FIG. 16 relates to
correction of color component Y in a case where the
second discrimination data is "NEW-TEXT".

A correction table shown in FIG. 17 relates to correction of color component Y in a case where the second discrimination data is not "NEW-TEXT".

5 A correction table shown in FIG. 18 relates to correction of color component K in a case where the second discrimination data is "NEW-TEXT".

A correction table shown in FIG. 19 relates to correction of color component K in a case where the second discrimination data is not "NEW-TEXT".

10 The screen processing section 104 processes each pixel of the corrected second image data input from the gamma correction section 103 in accordance with the second discrimination data input synchronously from the line buffer 101b, thereby outputting image data of each
15 color component matching with the image output means 15 in the rear stage. The processing is, for example, an error spreading process for converting image data of 8 bits per pixel (256 tone levels) to image data of 1 bit (2 tone levels).

20 The image output means 15 transfers the output image data from the screen processing section 104 onto printing medium (paper or the like).

In the first embodiment, the first discrimination data is generated from the image development means and
25 the second discrimination data is generated from the discrimination data generating means, for example, in the following manner.

a) The image development means generates first discrimination data that discriminates whether each pixel is associated with a character or a line figure, and the discrimination data generating means generates
5 second discrimination data that does not discriminate whether each pixel is associated with a character or a line figure, using the first discrimination data generated by the image development means.

The character is an object disposed in the first
10 image data as font data.

The line figure is an object described by a straight line and a curve.

b) The image development means generates first discrimination data that does not discriminate whether
15 each pixel is associated with a line figure or a plane figure, and the discrimination data generating means generates second discrimination data that discriminates whether each pixel is associated with a line figure or a plane figure, using the first discrimination data
20 generated by the image development means.

The plane figure is an object, the entirety or each component of which is painted out with uniform density.

c) The image development means generates first
25 discrimination data that does not discriminate whether each pixel is associated with a contour portion or an inside portion of a plane figure, and the

discrimination data generating means generates second discrimination data that discriminates whether each pixel is associated with a contour portion or an inside portion of a plane figure, using the first discrimination data generated by the image development means.

d) The image development means generates first discrimination data that discriminates whether each pixel is associated with a plane figure or a tone image, and the discrimination data generating means generates second discrimination data that does not discriminate whether each pixel is associated with a plane figure or a tone image, using the first discrimination data generated by the image development means.

e) The image development means generates first discrimination data that discriminates that each pixel is associated with a tone image, and the discrimination data generating means generates second discrimination data that discriminates the magnitude of density variation in each pixel, using the first discrimination data generated by the image development means.

As has been described above, the first embodiment comprises the discrimination data generating means for generating the second discrimination data on the basis of the first image data and the first discrimination data generated from the page information described in the page description language, and the image data

generating means for correcting the first image data on the basis of the second discrimination data and generating the second image data, thereby performing an image quality enhancing process matching with the output characteristics of the printer.

Second to sixth embodiments of the invention will now be described.

FIG. 20 shows the structure of an image processing apparatus 2 according to a second embodiment.

The main difference between the image processing apparatus 2 of the second embodiment and the image processing apparatus 1 shown in FIG. 1 is that a discrimination data generating means 122 generates second discrimination data, without using first discrimination data generated by image development means 121. Thereby, the independency of the first discrimination data and second discrimination data is enhanced, a greater degree of freedom is provided by the circuit configuration.

However, when image data generating means 123 generates second image data and when image processing means 124 switches the processing, both the first discrimination data and second discrimination data needs to be referred to.

FIG. 21 shows the structure of an image processing apparatus 3 according to a third embodiment.

In the image processing apparatus 3 of the third

embodiment, the image data generating means 123 of the image processing apparatus 2 shown in FIG. 20 is omitted. Since the image processing apparatus 3 of the third embodiment does not generate the second image data, the line memory, etc. are not needed and the image processing apparatus can be formed at low cost.

FIG. 22 shows the structure of an image processing apparatus 4 according to a fourth embodiment. In the image processing apparatus 4 of the fourth embodiment, the controller unit (image development means 11) of the image processing apparatus 1 shown in FIG. 1 is omitted and it is provided as an external element. In addition, interface means (data input means 141) as interface with the external controller and discrimination type setting means 146 are provided.

The data input means 141 of the image processing apparatus 4 is, for example, an interface unit of a LAN (Local Area Network).

The discrimination type setting means 146 is a means for setting the type of the first discrimination data input by the external controller. Specification information of the external controller is input to the discrimination type setting means 146, and the discrimination type setting means 146 is preset by the operation by a user, a manager, a designer, etc.

The discrimination types of first discrimination data described in connection with the first embodiment

are "TEXT", "GRAPHIC" and "IMAGE", and the correspondence of the three discrimination types as shown in FIG. 7 is registered (set) by the discrimination type setting means 146.

5 With this structure, an external controller that generates any kind of discrimination data can be connected to the image processing apparatus 4.

FIG. 23 shows the structure of an image processing apparatus 5 according to a fifth embodiment. In the
10 image processing apparatus 5 of the fifth embodiment, the controller unit (image development means 121) of the image processing apparatus 2 shown in FIG. 20 is omitted and it is provided as an external element. In addition, interface means (data input means 151) as
15 interface with the external controller and discrimination type setting means 156 are provided.

The data input means 151 of the image processing apparatus 5 is, for example, an interface unit of a LAN (Local Area Network).

20 The discrimination type setting means 156 is a means for setting the type of the first discrimination data input by the external controller. Specification information of the external controller is input to the discrimination type setting means 156, and the
25 discrimination type setting means 156 is preset by the operation by a user, a manager, a designer, etc.

The discrimination types of first discrimination

data described in connection with the first embodiment are "TEXT", "GRAPHIC" and "IMAGE", and the correspondency of the three discrimination types as shown in FIG. 7 is registered (set) by the discrimination type setting means 156.

With this structure, an external controller that generates any kind of discrimination data can be connected to the image processing apparatus 5.

FIG. 24 shows the structure of an image processing apparatus 6 according to a sixth embodiment. In the image processing apparatus 6 of the sixth embodiment, the controller unit (image development means 131) of the image processing apparatus 3 shown in FIG. 21 is omitted and it is provided as an external element. In addition, interface means (data input means 161) as interface with the external controller and discrimination type setting means 165 are provided.

The data input means 161 of the image processing apparatus 6 is, for example, an interface unit of a LAN (Local Area Network).

The discrimination type setting means 165 is a means for setting the type of the first discrimination data input by the external controller. Specification information of the external controller is input to the discrimination type setting means 165, and the discrimination type setting means 165 is preset by the operation by a user, a manager, a designer, etc.

The discrimination types of first discrimination data described in connection with the first embodiment are "TEXT", "GRAPHIC" and "IMAGE", and the correspondence of the three discrimination types as shown in FIG. 7 is registered (set) by the discrimination type setting means 165.

With this structure, an external controller that generates any kind of discrimination data can be connected to the image processing apparatus 6.

As has been described above, according to the embodiments of the present invention, a high-image-quality image process matching with output characteristics of a printer can be performed, even in a case where an ordinary printer controller is used.